FINAL REPORT

AWPF Grant #09-165 WPF

NATIONAL WILD TURKEY FEDERATION

For work conducted on the

ALPINE RANGER DISTRICT

APACHE-SITGREAVES NATIONAL FOREST

Prepared by Scott P. Lerich
Senior Regional Biologist
National Wild Turkey Federation

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Executive Summary

This is the Final Report for AWPF Grant #09-165 WPF, as required by contract. The grant application was prepared and submitted in June 2008 by the National Wild Turkey Federation (NWTF). A presentation was made to the Commission in September 2008, and awards were announced in December 2009. The budget for this grant, Alpine Ranger District Riparian Improvement, was $372,579.00. An extension was granted in the fall of 2012 due to unforeseen circumstances with a final completion date of September 2015. Reasons for the extension included a major illness of the Project Coordinator, transfer of primary US Forest Service staff, and a major wildfire event on the Alpine Ranger District, the Wallow Fire, which eventually impacted approximately 539,000 acres, including 5 of 8 project sites targeted for improvement with this grant. The Wallow Fire was the primary and most important factor for delaying implementation of habitat improvements. The largest wildfire to date in Arizona, the Wallow Fire not only directly impacted the landscape, but altered work duties for all US Forest Service employees on the Alpine Ranger District and many across the Apache-Sitgreaves National Forest. This led to delays in permit issuance and personnel availability. However, the issues were overcome and field work commenced in 2013. Another secondary issue which inhibited progress was the turnover in staff at AWPF. While not major, it occasionally played a role. One factor of the delay was a reduction of costs related to habitat improvements. This was expressed in 2 primary ways. First work at the Campbell Blue project site was decreased in scope saving some money and second, the price of materials in 2008 when the application was prepared where at record highs and by 2013 the costs of nearly all materials and fuel had returned to lower levels.

The Executive Summary from the original grant application is included here:

As part of a previous AWPF grant (05-129WPF), the National Wild Turkey Federation (NWTF) conducted a riparian inventory field survey on 69 sites across the entire Apache-Sitgreaves National Forest on all five ranger districts. Items documented during site visits included, but were not limited to: ranger district, watershed, GPS coordinates, name of site/spring/stream, date of visit, state of the site relative to water, NEPA (National Environmental Policy Act) documentation or requirements, archeology concerns, social concerns, large herbivore use/access, recreational use/potential, threatened or endangered species concerns, distance from roads or other anthropomorphic influences, potential technique for protection or restoration, reasons for concern, and any other site specific conditions of relevance. The most important part of the description may be the potential restoration techniques relevant to each site.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Based upon this activity, eight sites on the Alpine Ranger District have been identified as part of this grant application that are in need of riparian improvements. The first site is called the Boneyard, west of Alpine, Arizona in Apache County. Protection and enhancement of habitat for a number of sensitive species including the California floater (*Anodonta californiensis*), Loach minnow (*Rhinichthys (Tiaroga) cobitis*), Chiricahua leopard frog (*Rana chiricahuensis*), and Bebb's willow (*Salix bebbiana*) is needed. This project will affect approximately 40 acres and allow for Bebb's and other species of willow to grow without being browsed upon by elk (*Cervus elaphus*) and trespass cattle.

The second site is the Campbell Blue River near Luce Ranch south of Alpine in Greenlee County. No cattle are authorized to graze the USFS lands here, but elk are starting to have an impact. Mexican spotted owls (*Strix occidentalis lucida*) use this area, and Loach minnows are present. Beaver (*Castor canadensis*) activity is moderate to high here and a local population of cardinal flower is found here, one of a very few in the state of Arizona. A declining riparian habitat is found here now but is in danger due to encroachment of conifer species leading to a shift in habitat from a cottonwood and willow gallery forest to a coniferous dominated habitat. USFS approved conifer timber thinning of 439 acres along the Campbell Blue River would be used to restore this riparian habitat.

The third site is North Springs, west of Alpine in Apache County. This unique site, a roadside spring leading to a fen meadow, contains Bebb's willow and is used by Mexican spotted owls and northern goshawks (*Accipiter gentilis*). Overuse by large browsing ungulates has lead to a decline in the isolated stand of Bebb's willows. Protection of existing Bebb's willow is recommended here.

The fourth site is the Home Creek site. This site is also west of Alpine in Apache County. Riparian species of importance here include California floaters and Bebb's and other willow species. Overuse by elk is suspected to be the leading cause of the decline of a previously extensive stand of Bebb's willow, which now consists of only remnant skeletons on the verge of total extirpation. A recovered willow stand at this location is likely to be utilized by Southwestern willow flycatchers (*Empidonax traillii extimus*), and possibly other riparian obligate endangered species.

The fifth site is Three Forks, west of Alpine in Apache County and just downstream of the Boneyard site. This site is home to spring snails, Chiricahua leopard frogs, California floaters, Loach minnows, and willow stands. Restoration techniques will include the restoration of spring boxes to prevent the invasion of crayfish into the spring boxes and protect spring snails. The US

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Fish and Wildlife Service is considering listing the Three Forks spring snail (*Pyrgulopsis trivialis*) as federally endangered and at the time of this application is in the process of reviewing the species' status.

The sixth site is Hulsey Fork, north of Alpine in Apache County and just west of Escudilla Mountain. Hulsey Fork contains an extensive stand of willows, at least 2 species including Bebb's willow. The riparian habitat is used by Mexican spotted owls and northern goshawks and is impacted by both cattle and elk. Overuse of this meadow by large browsers is leading to damage to the existing stands of willow

The seventh site is Turkey Creek located just outside of Alpine, AZ along US Highway 191. An isolated stand of Bebb's willow is present and subjected to overuse by elk. Protection of this stand of willow is desirable for riparian habitat protection and restoration.

The eighth and last site, Upper San Francisco River is located just outside of Alpine, AZ at the top of the San Francisco River drainage. An isolated stand of Bebb's willow is present and subjected to overuse by elk. Protection of this stand of willow is desirable for riparian habitat protection and restoration.

Properly functioning riparian areas serve key roles in providing fish and wildlife habitat, preserving water quality and water supply, and providing recreational opportunities. Our goal with this project is to improve and enhance riparian habitat on eight riparian sites on the Apache-Sitgreaves National Forest. Specifically this project will provide many values to society and natural ecosystems, including (1) improved water quality and natural flood and erosion control, (2) key habitats for many different species of plants and wildlife, (3) courtship and nesting conditioning habitats for migratory waterfowl and songbirds, (4) habitat for threatened, endangered and sensitive species, and (5) focal settings for recreational activities including nature study, photography, camping, hiking, birding, fishing, and hunting.

Also from the original application is this Background information:

In the arid western United States, riparian areas are estimated to be less than 2% of the total land area. Some estimate the acreages of riparian areas in Arizona are only 0.5% of Arizona's total area, a percentage that is much smaller than the estimated average for the arid western United States. Despite their small area, the role of riparian areas is disproportionate to their size, particularly in the semi-arid regions of North America. This is mainly due to the many functions and values of riparian areas.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Riparian areas support more productive and diverse vegetation assemblages and serve more ecological functions than their terrestrial upland counterparts. These areas provide important links between terrestrial upland and aquatic ecosystems. Their most important functions are to: 1) filtrate and retain sediments and nutrients from terrestrial upland runoff or out-of-bank floods 2) reduce chemical inputs from terrestrial uplands by immobilization, storage and transformation 3) stabilize stream banks and build-up new stream banks 4) store water and recharge subsurface aquifers 5) reduce floodwater runoff and 6) support animal habitat and enhance fish habitat.

A large percentage of wildlife depends on riparian areas for foraging, nesting or cover during part of, or for their entire life cycle. These habitats are even more important in the southwestern United States where riparian areas are recognized as critical areas. In Arizona, the USDA Forest Service General Technical Report RM-43:68-79 reported that eighty percent of all vertebrates spend some portion of their life cycle in riparian areas. In addition riparian vegetation can provide food, cover or regulate stream temperature (by shade), three important factors that can impact the survival of native fish populations.

The Endangered Species Act of 1973 (amended in 1988) was passed to conserve threatened and endangered species. It lists and monitors all the threatened and endangered species. Defenders of Wildlife noted in their 1989 study that seventy percent of threatened and endangered vertebrates in Arizona depend on riparian habitat. Domestic livestock are also attracted to these areas because of the high forage abundance and water availability. The many aesthetic values of riparian areas add to the complexity of their management. Riparian areas are considered prime areas for recreational activities such as hiking, horse-back riding, cycling, fishing, hunting, swimming, rafting, boating, canoeing, bird and wildlife watching, picnicking, camping and off-road vehicular travel with ATV's.

The National Research Council (2002) recommended that the restoration of riparian areas be a national goal with protection of these areas as a major focus. In addition, the lack of information on the status and trends of riparian areas requires an extensive and detailed assessment of these areas. As riparian areas continue to disappear or are degraded, those remaining in National Forest ownership become increasingly more valuable and need protection.

The National Wild Turkey Federation (NWTF) with technical support from the U. S. Forest Service (Alpine Ranger District) is requesting funding to complete riparian restoration on eight sites. These sites were previously identified as part of a previous AWPF grant (05-129WPF). The NWTF conducted a riparian inventory field survey on 69 sites across the entire Apache-Sitgreaves National Forest on all five ranger districts. These eight sites have been identified for restoration based upon the following, state of the site relative to water, NEPA (National

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Environmental Policy Act) documentation or requirements, archeology concerns, social concerns, large herbivore use/access, recreational use/potential, threatened or endangered species concerns, distance from roads or other anthropomorphic influences, potential technique for protection or restoration, reasons for concern, and other site specific conditions of relevance. The most important component is the potential restoration techniques relevant to each site.

Boneyard project site – We want to stop vehicle traffic from crossing the stream here and to clean up trash which resulted from a structure at Clabber City which burned down during a wildfire. This project will affect approximately 40 acres and allow for Bebb's and other willow species to grow without being browsed upon by elk and trespass cattle. Fencing of springs and Bebb's willows will be accomplished with bull panels instead of fencing a large area with elk proof fencing. The clean-up of old trash and the fire damaged structure would prevent any possible contamination of the riparian habitat. Not to mention the aesthetic value and safety factor of removing the debris from this site.

Campbell Blue project site – Thinning of conifer species to allow regeneration of willow, cottonwood, and other riparian vegetation will affect 439 acres of conifers up to 300 feet on both sides of the river from the boundary of the Luce Ranch downstream to the junction of the Campbell Blue with the Blue River. Since this area is designated as a road less area all work will be accomplished with hand work and without entering the area with vehicles. Piles of thinned materials will be burned when conditions are appropriate and safe. Species of concern which will benefit from the completion of this project include zone-tailed hawks (*Buteo albonotatus*), common black hawks (*Buteogallus anthracinus*), gray catbirds (*Dumetella carolinensis*), yellow-billed cuckoo (*Coccyzus americanus*), loach minnow (*Tiaroga cobitis*), cardinal flower (*Lobelia cardinalis*), and Mexican spotted owls. With the recovery of a healthy riparian forest Southwestern willow flycatchers may begin to utilize the project site.

North Spring project site – We will use bull panels here to protect Bebb's willows along a short stretch of stream below the spring. Bull panels will be used in lieu of exclosure fencing in order to protect smaller stands of willows and not fence out large areas thus allowing wildlife access to existing water below the springs. Approximately 5 acres would be affected by the project at this site.

Home Creek project site – This site will utilize fencing to protect a formerly large stand of willows which have declined to the point of nearly being extirpated. Heavy browsing by elk is preventing the re-establishment at least two species of willows, including Bebb's willow. This fence would enclose approximately 20 acres. (It was decided, and approved by AWPF staff, in

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

2010 this site would not utilize a large, 20-acre exclosure fence, but 4 smaller exclosures using bull panels; the large exclosure would be utilized at the Upper San Francisco River site).

Three Forks project site – We will do a small project here, protecting spring boxes to prevent the invasion of crayfish into the spring boxes and protect spring snails. Species of concern which would benefit from this project include endangered spring snails and California floaters. The Three Forks spring snail is now being considered for endangered species status and is found no where else in the world outside the immediate area of this project site. The US Fish and Wildlife Service, Arizona Game and Fish Department, and spring snail experts will be consulted before any changes or modifications are made to the existing spring boxes found here.

Hulsey Fork project site – We will use bull panels at this site to protect existing stands of at least two species of native willows, including Bebb's willow. Bull panels will be used to protect specific willow stands and not prevent the use of this large meadow by cattle and elk. Sensitive species found here include Bebb's willow, Mexican spotted owls, and northern goshawks. Approximately 10 acres will be affected by the project at this site.

Turkey Creek project site – We will use bull panels at this site to protect isolated stands of Bebb's willows from overuse by elk. Bull panels are being used in order to protect specific willow stands and not exclude elk from large areas. Approximately 5 acres will be affected by the project at this site.

Upper San Francisco River project site – We will use bull panels at this site to protect isolated stands of Bebb's willows from overuse by elk. Bull panels are being used in order to protect specific willow stands and not exclude elk from large areas. Approximately 5 acres will be affected by the project at this site. (It was decided, and approved by AWPF staff, in 2010 this site would not utilize small bull panel exclosures but a larger, single exclosure; the bull panels would be used at the Home Creek site).

This project was a cooperative effort between the NWTF and the U.S. Forest Service, Alpine Ranger District on the Apache Sitgreaves National Forest. The Forest Service is interested in improving the riparian habitat on the project sites and since wild turkey hens bring their broods of young poults along the edges of riparian areas to feed on grass seeds and grasshoppers, the NWTF is interested in riparian restoration to help in its wild turkey restoration efforts in the Southwest. The Forest Service will provide technical support throughout the project duration and ensure regulatory compliance. The NWTF will develop all project plans, oversee any construction, conduct the project monitoring, and provide the overall management of the project.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

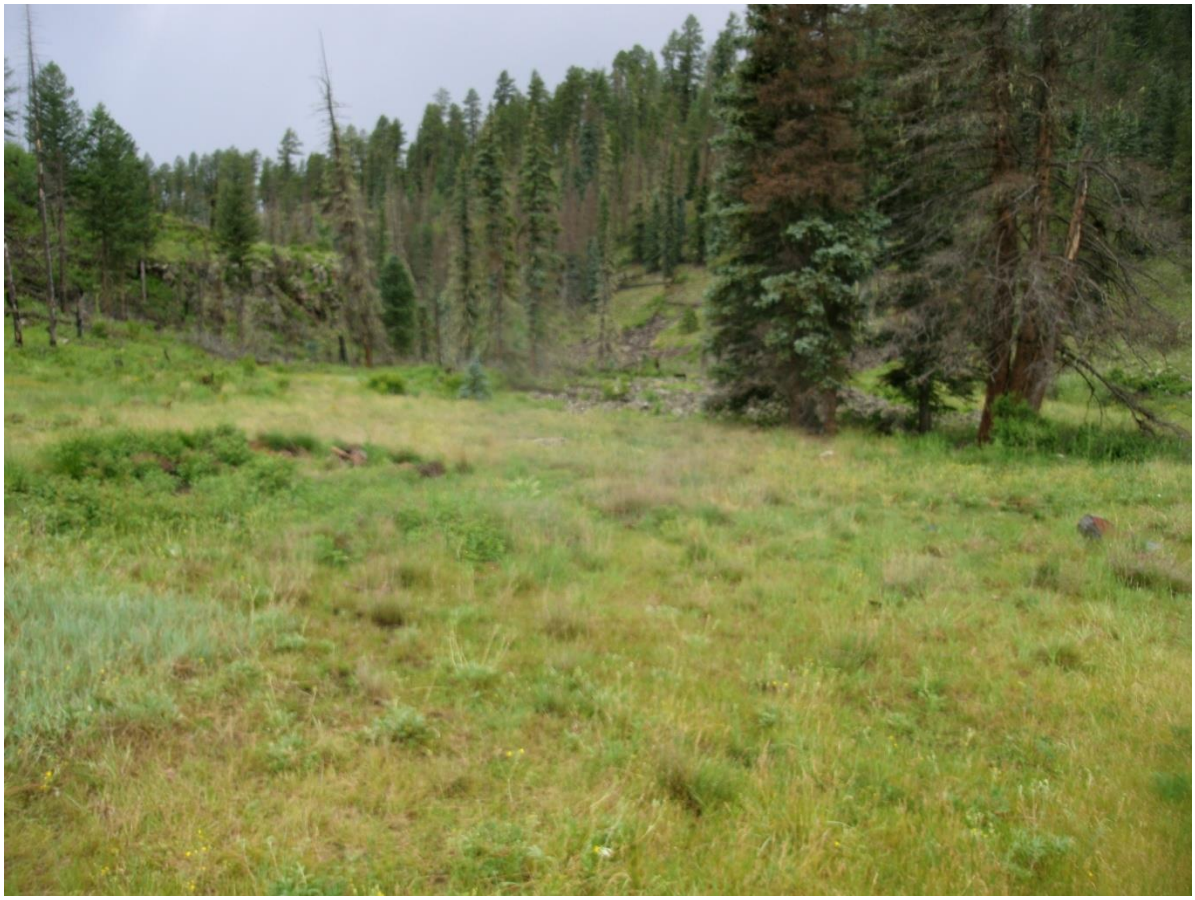
Figure 1. Photo of debris at Clabber City project site. Photo taken 1 June 2008

Figure 2. Photo of heavily browesed willow at Clabber City project site. Photo taken 1 June 2008

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

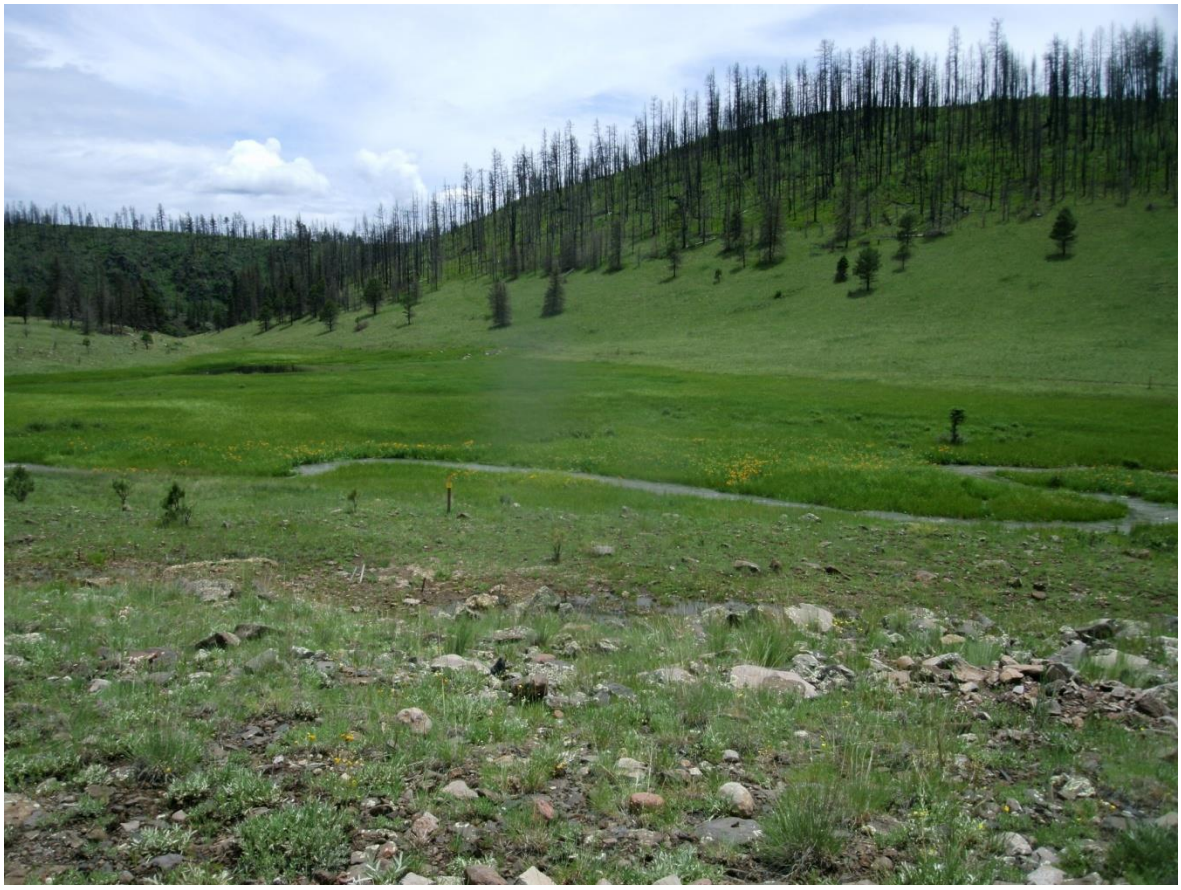
Figure 3. Photo of Clabber City following removal of debris from the project site. Photo taken 15 July 2015



The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 4. Photo of the Three Forks project site taken 14 July 2015. Note lush riparian/wet meadow vegetation in the bottom, along with timber burned during the June 2011 Wallow Fire in the background. The fire appears to have not negatively impacted the Three Forks site directly. This is the site of modifications of spring boxes for the benefit of the Three Forks Springsnail.



The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Figure 5. Springbox (SB3) modification at Three Forks project site to protect springsnail habitat from invasive crawfish. Photo taken June 2015 during annual springsnail survey by AZGFD. The original rock springbox is visible below with the modification above, and painted to help it blend into the landscape.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 6. A springbox at Three Forks project site prior to modification for springsnail habitat. This was the condition of each of the springboxes at this site. Photo taken June 2008.

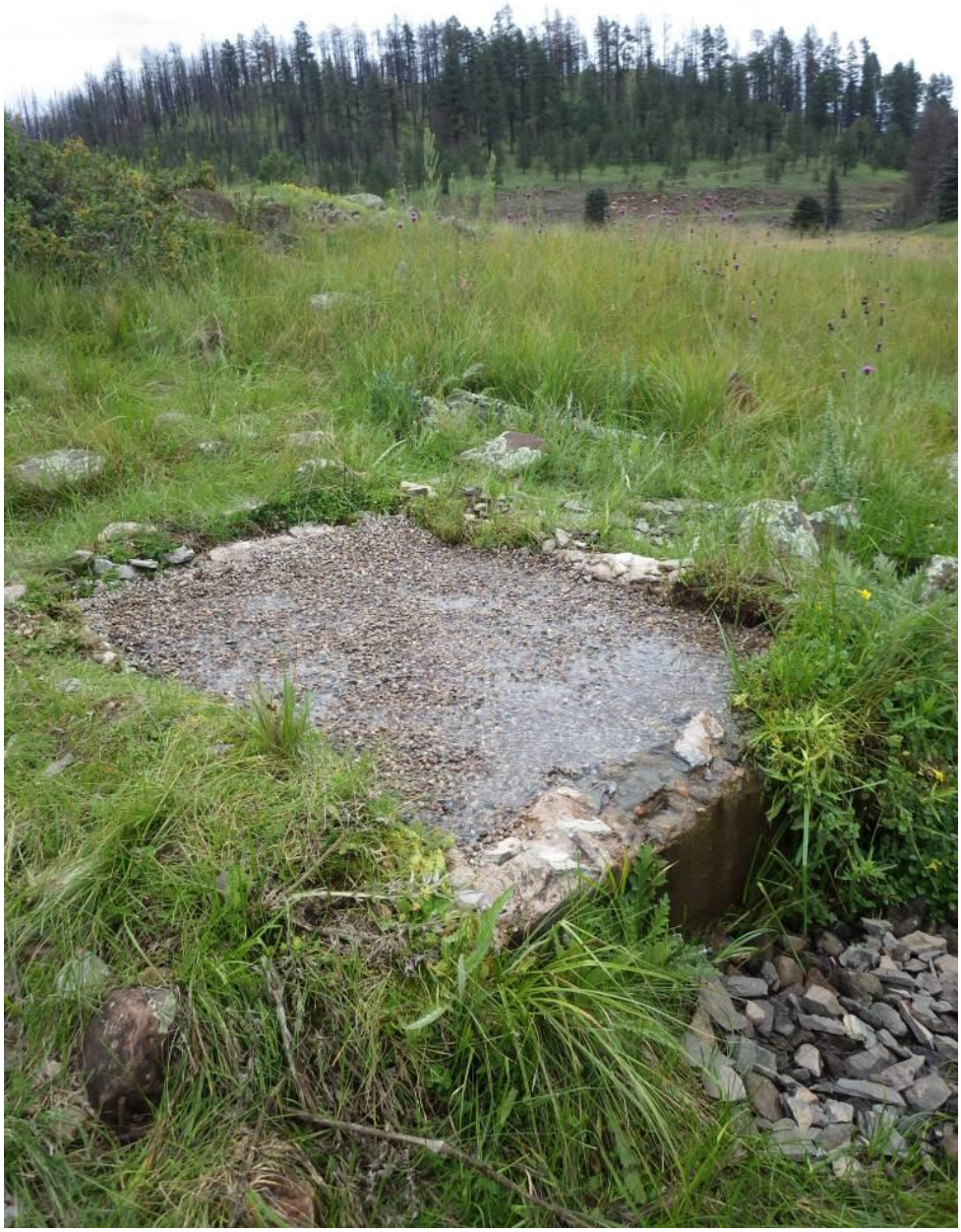
The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 7. Springbox SB2 at Three Forks project site during modification work. Following removal of crawfish, a network of 4" pipes (connected at the bottom and with many small openings cut into them) were placed in the springbox. Then moderate sized, clean, washed, rock was placed in the spaces between the 4" pipes. Photo taken in June 2014

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Figure 8. Springbox SB2 at Three Forks project site following modification. After the 4" pipes and clean, washed rock was in place, pea gravel was placed on top to fill the remainder of the space. The pea gravel provided adequate space for springsnails to live, but spaces too small for crawfish to live. It is believed this will provide a safe place for Three Forks Springsnails to thrive without being subjected to crawfish. Photo taken June 2014



The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

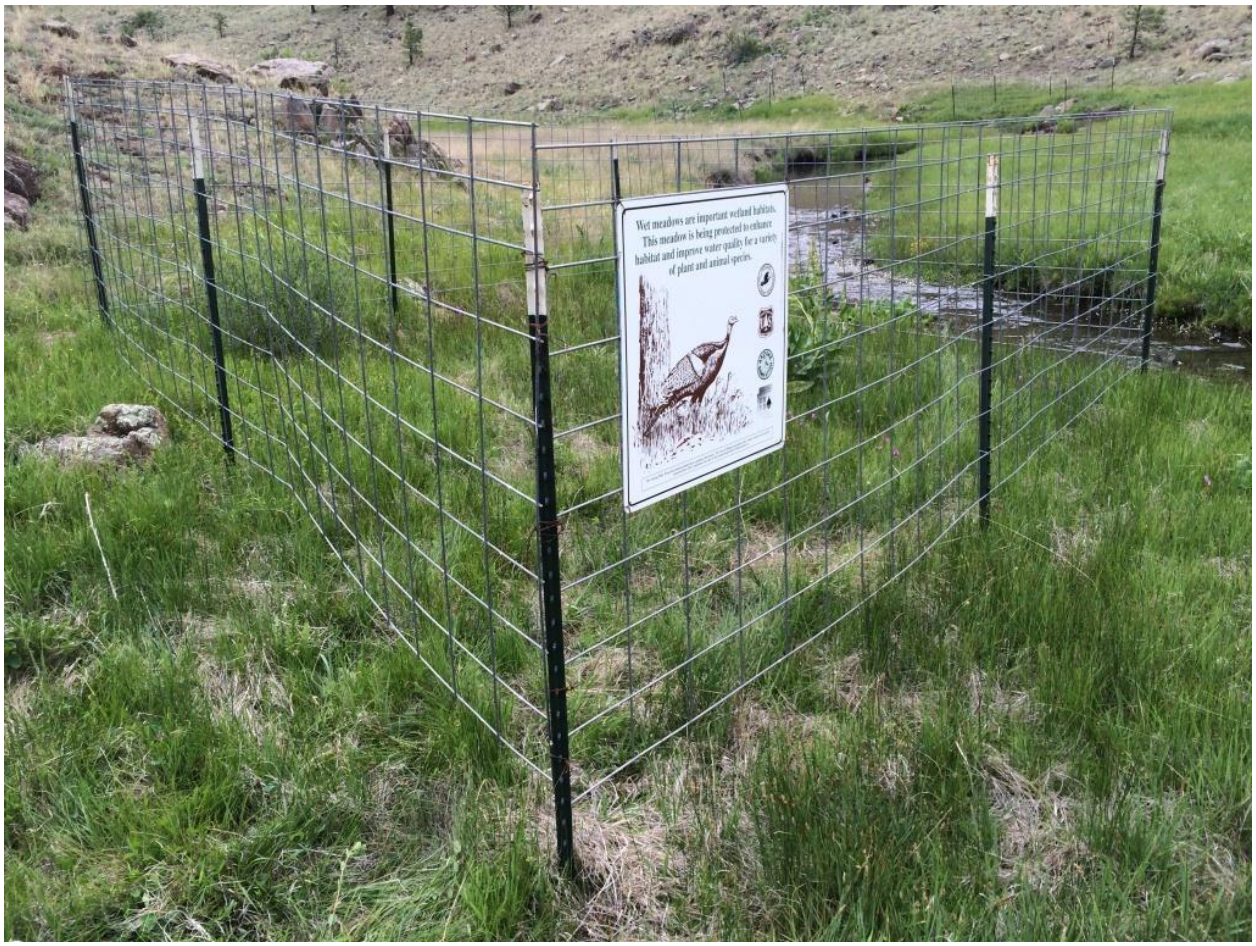
The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 9. Photo of Three Forks Springsnails taken during the June 2015 annual survey conducted by AZGFD. Photo taken at Boneyard Bog site north of our project sites.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 10. Small exclosure protecting willow (left side) and small spring flow habitat of Three Forks Springsnail, along Boneyard Creek, upstream of Clabber City. Photo taken June 2015.



The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

This grant focused on riparian habitat improvement work at 8 specific locations on the Alpine Ranger District, Apache-Sitgreaves National Forest. These ranged in size from the Campbell Blue project site at 439 acres to the North Spring project site of less than 5 acres. During 2010 it was determined to "swap" methods between the Home Creek site and the Upper San Francisco River site. Home Creek was originally designed to receive a large exclosure fence and Upper San Francisco River was originally designed to receive a number of small exclosures. Objectives at both sites focused on protection of native stands of willow, specifically Bebb's willow. At the time, AWPF Project Manager, Rodney Held, agreed to allow us to use a large exclosures at the Upper San Francisco River site and small exclosures at Home Creek. In hind-site this was a wise decision.

All objectives were met and results at the time of this report are positive.

Summary of Methodologies Used

Methods and techniques varied across the project relative to objectives and site specific attributes. At the Boneyeard/Clabber City project site multiple objectives were planned, including small exclosures, removal of debris from an old homestead site, and the closing of a long-time creek crossing on an unofficial USFS road. At Campbell Blue project site the plan called for mechanical thinning of coniferous trees from the riparian habitat along the Campbell Blue River using a USFS crew with chainsaws. At 4 sites, North Spring, Hulsey Fork, Turkey Creek and Home Creek, small exclosures were installed surrounding Bebb's willow to facilitate their protection. At the Upper San Francisco River project site, a large exclosure fence was constructed to exclude ungulates from the meadow protecting riparian vegetation, including Bebb's willow and to prevent trampling and compaction of the sensitive habitat found there. The final project site was Threeforks and the protection and enhancement of habitat for the Threeforks Springsnail was the focus of our work there. At the beginning of the project it was unknown if any work at this site would be conducted or not. The Threeforks Springsnail was under consideration for Federal listing as an Endangered Species and in fact during the life of this grant, it was listed. Consultation with the US Fish and Wildlife Service, the Arizona Game and Fish Department and springsnail experts was undertaken and a plan was presented to the AWPF and approved. The plan was to modify and enhance existing springboxes at the Threeforks site to exclude exotic crawfish and provide more suitable habitat for the springsnail.

Photography was also used at all sites for documentation and monitoring. Photo points were established at appropriate at all sites and remote digital cameras were used at Campbell Blue and

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Upper San Francisco River site. The remote digital cameras were first used in the summer of 2013 on the Campbell Blue project site. However, a large flood event on approximately 13 September of 2013, 2 weeks prior to the scheduled removal of the cameras, occurred and resulted in the loss of cameras on that site. These were replaced and new cameras were set out at both sites in 2014 and 2015 with mixed results.

Outcome of all Tasks

Overcoming the initial issues leading to the extension of the grant project led to some tasks being completed out of order, but all work was eventually completed. Task #1, Permits, Clearances, Authorizations, and Agreements, was perhaps the most difficult to complete. When the primary USFS employee transferred from the Alpine Ranger District in December 2010 it set in motion a number of factors which led to delays. Then the Wallow Fire started in late May 2011 and affected the timeline even more. But eventually all permits and agreements were secured from the Apache-Sitgreaves National Forest and work commenced. Task #2, Prepare and Submit Plans, was completed and approved by AWPF for implementation. Task #3, Implement Habitat Enhancement Design Plan, was initiated in steps. The first was Campbell Blue conifer thinning. Initial work was started in winter of 2011 (Jan – Mar). Then the Wallow Fire event occurred in May – June 2011 and delays in all projects began. All exclosure fencing was contracted and installed in the summer of 2013. This work was conducted at Upper San Francisco River, North Spring, Hulsey Fork, Turkey Creek and Home Creek but the same contractor. Exlosures at the Boneyard Creek project site were installed in summer 2014. The final work at Threeforks project site was also completed in summer 2014. At that time all objectives of Task #3 were completed. Task #4, Implement Monitoring began in 2013 and continued in 2014, and 2015. Monitoring reports for each year's efforts were submitted. Task #5 Implement Public Outreach, was delayed and not completed on schedule due to NWTF staff turnover and work load. Information signs from a previous AWPF grant were available for use and were placed at all sites as appropriate. Originally budgeted for $2,000 this portion of Task #5 was completed at no cost. Other aspects of the Task #5 included preparing an article for the NWTF Turkey Country magazine and production of banner stands for use at the AWPF, USFS Apache-Sitgreaves NF offices and NWTF events in Arizona and at NWTF HQ. Additional articles, such as a joint article with AZGFD for publication in the AZGFD Wildlife Views magazine will be produced and will not be printed/published until approved by AWPF staff. The banner stand information is attached here as is the Turkey Country article, both pending approval by AWPF staff. Task #6, Progress Reports and Project Coordination, have been completed and cover all required aspects of the overall project. Task #7, Final Report is now complete. NWTF Project Coordinator time management was also a factor in reporting as during the 3 year delay between

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

application submission (2008) and finally having all permits, authorizations, agreements, and clearances complete (2012) additional work was undertaken. This led to some conflicts with time and as a result some deadlines were missed during the 2013 – 2015 timeframe. However, all work was completed and riparian habitat at all 8 sites has been enhanced for the benefit of wildlife and the citizens of Arizona.

Public Outreach Plan

The Public Outreach Plan for this grant (AWPF Grant #09-165 WPF) was outlined in the original grant application as follows:

Signs will be erected at the site to inform the public of the funding agencies and purpose of the project. Articles concerning the project will be written and submitted to the National Wild Turkey Federation, and the Arizona Game and Fish Department for inclusion into their publications. Additional outlets will be sought for public outreach, including but not limited to local television, radio, and newspapers concerning the proposed project, as well as web site based outlets.

Public outreach for this Grant will included the installation of signs, in coordination with the US Forest Service (USFS), at each of the 8 project sites to inform the public of the funding agencies and purpose of the project. This method has been successful and well received at other sites on the Alpine Ranger District in the past.

Articles concerning the project will be written and submitted to the National Wild Turkey Federation (NWTF), and the Arizona Game and Fish Department (AZGF) for inclusion into their publications. These articles will also be available for placement on the website of the NWTF.

An additional electronic medium now available is the NWTF and Arizona NWTF Facebook page, as well as the Arizona NWTF webpage.

Portable information panels (Banner Stands) will be available for use at the Alpine Ranger District, the Apache-Sitgreaves National Forest Supervisor's office, and for use at other public meeting sites. These panels will be produced by the NWTF professional media staff with input from the Site Coordinator and Project Manager. A set of panels will be available to the Arizona Water Protection Fund, USFS, and the NWTF, as well as the Arizona Game and Fish Department if they desire them.

With the Wallow Fire impacting all 8 sites public outreach is likely to be more important than anticipated. This large scale wildfire (538,000 acres) will have direct impacts on the water

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

quality and quantity on the Apache-Sitgreaves National Forest. The public will want to know what is being done to mitigate potential damage or water quality issues, and the work allowed under this grant will provide a unique opportunity to inform the public of the importance of protecting our natural resources, not only forests and streams, but water itself.

Signs

Signs were placed at all project sites, except for the Campbell Blue and Three Forks project sites. At Three Forks there were already USFS information signs present and the addition of a new sign would have been awkward and unsightly. The Campbell Blue project site is centered along a public roadway maintained by Apache and Greenlee counties and as such signs are not permissible. Signs were placed at Boneyard Creek, North Spring, Turkey Creek, Home Creek and Hulsey Fork on the small exclosures and at the Upper San Francisco River project site on the large exclosure fence. Aluminum 2'x2' signs remaining form a previous AWPF/NWTF grant were approved for use and no new signs were necessary.

Educational Brochures

Educational three-fold brochures were originally planned but were ultimately not developed as these are ineffective in our quickly changing digital world.

Popular Articles

A written article was prepared for approval by AWPF and submitted to the NWTF for publication in Turkey Country magazine. An additional article is planned for future publication in the AZGFD bi-monthly magazine *Arizona Wildlife Views*. This article will be submitted to AWPF for approval prior to publication and will focus on the Three Forks Springsnail and how this project relates to its conservation. It will be co-authored by NWTF and AZGFD staff.

Additional Public Outreach

Local television, newspaper, and radio outreach opportunities are limited and nearly non-existent. A local TV show has been discontinued since our original plan was submitted and is no longer an option. Radio time has also been reduced in scope and is no longer a viable option. The local newspaper has also seen its distribution reduced as more and more these type of medians are moving toward digital.

Web Based Opportunities

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

The NWTF and the Arizona State Chapter of NWTF maintain Facebook pages and web sites on which all or part of the Final Report and Monitoring Report can be placed, along with photos.

New Opportunities for Public Outreach

The text and photos for NWTF portable banner stands is attached below. These banner stands are approximately 2 ½ feet wide and 6 feet tall, roll up into a portable container, and are easily moved from one location to another. Banner stands will be made available to the Arizona Water Protection Fund, Apache-Sitgreaves National Forest, the Arizona Chapter of NWTF, as well as the Project Coordinator for use in additional public outreach situations.

Summary of Project Data

Monitoring activities resulted in an abundance of data, from repeat photographs to detailed vegetation surveys. Perhaps the most useful data is repeated photography from established photo points. This allows for future analysis of each site if desired. Photos were taken at all sites and submitted on electronic media (CDs) to the AWPF. The installation of exclosures at 6 sites allow for vegetation surveys during the grant work, but also will allow for future vegetation analysis if desired. At the Campbell Blue project site, woody and herbaceous vegetation anaylsis was conducted. At all other sites only herbaceous vegetation analysis was conducted with the exception of the Bebb's willow monitoring. The last remaining data collections related to this grant were the Threeforks Springsnail surveys conducted by the AZ Game and Fish Department.

The window of data collection, over 3 years, is too short a time frame to make any long term assumptions. However, in nearly every case vegetation surveys showed a positive response to our treatments, whether it was Bebb's willow recovery or increase in grass cover. How much of a factor the Wallow Fire was in also unknown, but likely played a major role at some project sites. However, the Wallow Fire killed all above ground growth of Bebb's willow at North Spring and nearly all at Hulsey Fork. Bebb's willow is a fire tolerant species and while not all specimens killed have re-sprouted, many have. And as a result of our protection through this grant, these willows have a chance to not only survive but to thrive.

At North Springs, prior to fencing the NS-1 site there was one mature Bebb's willow at the site and signs of more ready to sprout. But these young willow sprouts experienced nearly constant browsing by ungulates. Following the Wallow Fire and exclosure installation, Bebb's willow at this site "exploded" in numbers. It will not be many years before the exclosure is completely full of Bebb's willow. In September 2013, 82 Bebb's willow sprouts were counted in NS-1, in 2014, 68 were counted, and in 2015, 135 willow sprouts were documented. The lower number in 2014 is likely a result of timing of the survey as it was late in the day and light conditions were poor.
The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

The increase in willow sprouts from 82 to 135 is significant and a sign of recovery and met objectives.

In looking at 3 sites with major Bebb's willow components, North Spring, Hulsey Fork, and Turkey Creek, data from 2013 to 2015 show an increase in gross numbers of willow sprouts. At these 3 sites, evaluating the number of willow sprouts inside the exclosures only, in 2013, 422 willow sprouts were documented for an average of 140.67 at each site. In 2014, 350 sprouts were documented for an average of 116.67 at each site, and in 2015, 436 sprouts were documented for an average of 145.67 at each site. And the 2015 data is missing a data point from Hulsey Fork where vegetation inside one exclosure was so thick it prohibited data collection. The difference in willow sprouts documented from 2013 to 2015 may seem small, but for this sensitive species, at sites where all above ground material was killed during the Wallow Fire, these numbers are encouraging. Without the protection afforded by the exclosures installed through this grant, Bebb's willow would likely no longer be present at North Spring and Hulsey Fork sites.

Woody vegetation analysis was only conducted at the Campbell Blue project site, where the Wallow Fire moderately impacted the habitat. Through visual analysis, the most obvious impact was the loss of mature cottonwood trees in the riparian bottom along the creek. While the fire resulted in the thinning of the stand of trees here, it seems to have impacted the mature cottonwoods the most, while leaving thousands of dead, standing ponderosa pine. Many of the dead pine were left standing when the thinning crew moved through the area during treatments. This will undoubtedly result in many trees being blown over in the next decade. Another result is the de facto natural thinning of conifers at this site. Signs of recovery of cottonwood, oak and willow are already obvious, but the woody vegetation analysis conducted through this grant only looked at frequency and canopy cover of each species. From 2013 to 2015, canopy cover of ponderosa pine at the Campbell Blue project site increased from 15.83% to 16.3% to 19.6%. While these numbers are increasing rather than decreasing, this is likely a result of a number of factors. Placement of the tape measure used to collect canopy cover data is not laid in the exact location annually. The other factor may be the recovery of individual ponderosa pines following the fire and abundant precipitation at this site in the years since the fire. Data collected here are not sufficient to tease out the reasons for the increase in canopy cover of ponderosa pine, but I doubt the increase is statistically significant.

Herbaceous vegetation analysis showed no clear pattern at the sites sampled. From year to year either grasses, forbs, or sedges would dominate cover within the Daubenmire Frames used to collect this data. As an example at the Upper San Francisco River project site, grasses

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

dominated the site each year. At the largest exclosure at North Spring, NS-1, sedges dominated in 2013, sedges and grasses in 2014 and grasses dominated in 2015. In 2013, at site NS-1, 135 sedges covering 95% of the frame were documented. In 2014, at site NS-1, 47 sedges covered 45% of the frame and 20 grasses covered 20% of the frame. And in 2015, grasses had taken over at the sample site in NS-1 with 75 individuals covering 85% of the frame. The same pattern, or lack of a pattern was exhibited at other sites, such as Hulsey Fork.

Avian point counts demonstrated no discernible pattern either, with timing of surveys and weather conditions playing a large role in bird abundance and activity. In 2013, 153 individual birds of 8 species were documented. Of these 153 birds, 110 were Violet-green Swallows. An

Figure 11. View of the Campbell Blue River from observation point #10. Photo taken 7 Sep 2007.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 12. Photo of Cambell Blue River taken 2 Oct 2014 from observation point #10. The Wallow Fire burned through this area in June 2011

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Figure 13. Photo of Cambell Blue River taken 17 July 2015 from observation point #10. The Wallow Fire burned through this area in June 2011

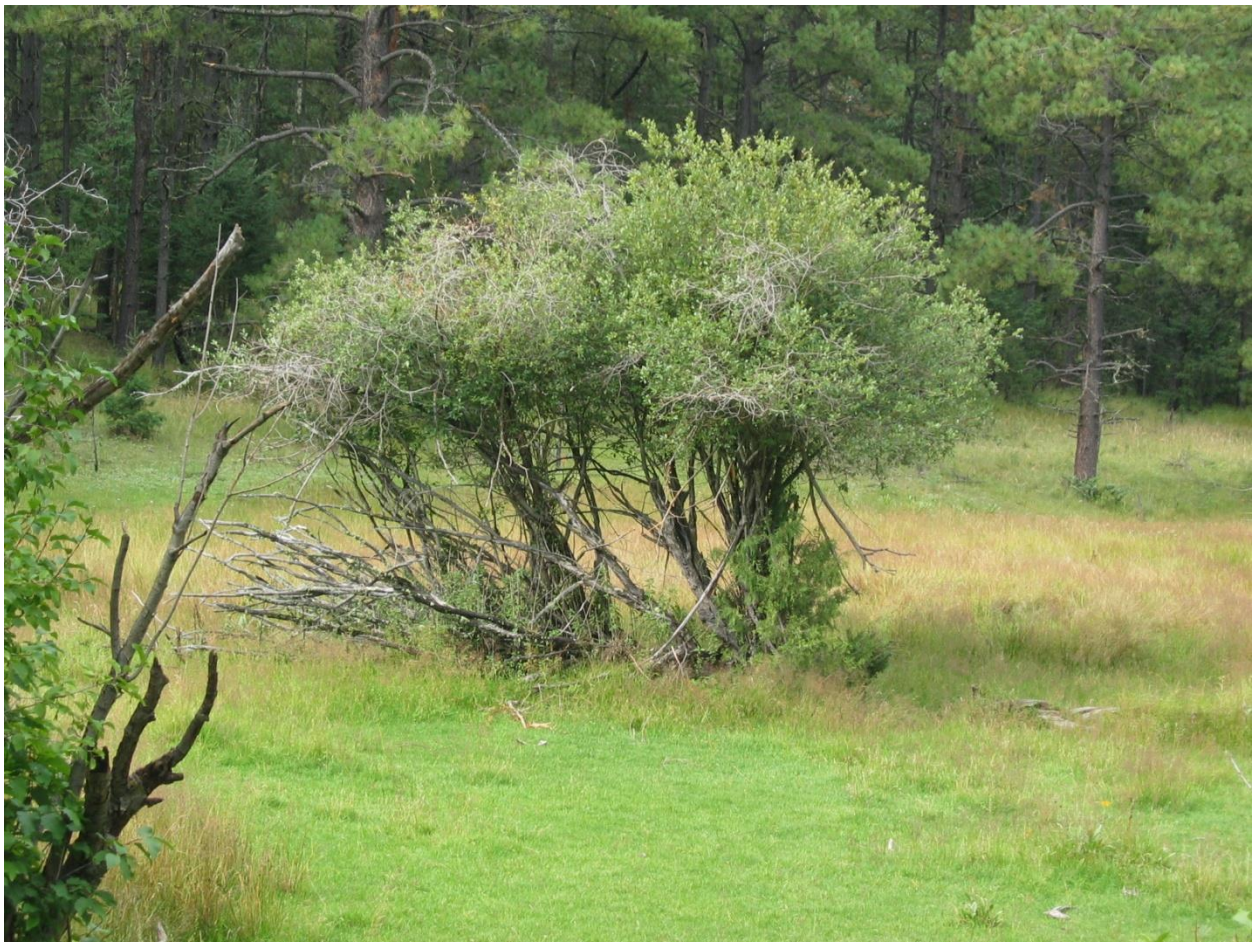
average of 12.75 individual birds was documented at each of 12 survey points in 2013. In 2014, during the 26 June survey, 109 individual birds of 17 species were documented resulting in an average of 8.4 individual birds observed at each of 13 survey points. During the 2 Oct survey, 56 individual birds of 11 species were documented, for an average of 4.3 individual birds observed at each of 13 survey points. In 2015, on 17 July, 123 individual birds of 18 species were documented resulting in an average of 9.5 individual birds observed at each of 13 survey

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

points. Twenty-six individual species of birds were documented during the point counts along the Campbell Blue project site, over the 3 years of monitoring. Avian point counts at the Upper San Francisco River project site were interesting, but since no major habitat conditions were altered or enhanced, these data are not as valuable. However, at total of 7 species were observed, during these surveys. Species documented at this site are Acorn Woodpecker, Purple Martin, Junco, Mourning Dove, American Robin, Red-faced Warbler, and Broad-tailed Hummingbird.

Survey data from the Threeforks Springsnail surveys conducted by Arizona Game and Fish Department are attached and not discussed here.

Figure 14. Hulsey Fork project site showing a heavily browsed Bebb's willow stand proposed for protection with exclosure fencing. Photo taken 7 Sep 2007



The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 15. Hulsey Fork project site . Hulsey Fork project site showing a large, heavily browsed Bebb's willow stand proposed for protection with exclosure fencing. Photo taken 7 Sep 2007

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 16. Hulsey Fork project site following installation of small exclosure fencing to protect stand of Bebb's willow. The Wallow Fire burned through this site in June 2011 and heavily impacted the stand of Bebb's willow. Note the dead willow on the left and the live one on the right. Bebb's willow sprout following fire and the stands at this project site have shown signs of recovery after the Wallow Fire and following installation of the small exclosures. Photo taken 15 July 2014

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 17. A fallen but living Bebb's willow at North Spring project site prior to project implementation. Photo taken 18 July 2007

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 18. A Bebb's willow skeleton at the North Spring project site. This site had limited numbers of living willow's prior to this project. Photo taken 18 July 2007

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Figure 19. Exclosure (N-1) at the North Spring project site. The Wallow Fire burned through in June 2011 heavily impacting this site. Most of the surrounding conifers were killed and all above ground growth of Bebb's willow were consumed in the fire. This photo shows Bebb's willows resprouting following the fire, now protected within this exclosure. Photo taken 15 July 2015 during project monitoring activities.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

Springsnail Survey Results

In 2013 and 2014, Arizona Game and Fish Department biologists, along with assistance from USFS, Phoenix Zoo, and NWTF staff, along with Dr. Terry Myers, surveyed for Three Forks Springsnail abundance and presence at Three Forks, Boneyard Creek and Boneyard Bog. In 2013 these surveys took place 12 – 14 August with 1,256 individual snails being documented at 11 of the 26 sites surveyed. Of the 26 sites surveyed, no snails were documented at 15 sites. At the 11 sites snails were documented at, the range of snails was 1 – 797 individuals, with a mean of 141.2 snails at each of those 11 sites. In 2014 snail surveys were conducted at 8 sites associated with projects funded by this AWPF Grant (Grant #09-165 WPF) only, from 2 – 3 April. At these 8 sites 161 snails were documented, all along Boneyard Creek, at only 3 sites (PT5 – 25 snails; PT6 – 61 snails; and Lopez Spring – 75 snails), with no snails documented at 5 sites (PT4, SB1A, SB1B, SB2, and SB3; the locations noted as SB are at the Three Forks project site and denote individual spring boxes, which were modified to exclude crayfish). Five other sites were not surveyed at this time (Three Forks SH, PT1, PT2, PT3 and PT7). For the 2014 data, a mean of 53.6 individual snails were documented at the 3 locations (PT5, PT6 and Lopez Spring). In 2015, from 23 -25 June, snail surveys were conducted at 27 sites, with snails documented at 12 sites, and zero snails documented at the remaining 15 sites. A total of 2,170 snails were documented at the 12 sites for a mean of 180.8 snails at each site and a range of 6 – 758. In 2015 heavy growth of herbaceous vegetation around springsnail habitat likely interfered with the ability to document more individual snails While it is important to attempt to conduct a complete survey of each site, it is perhaps more important to not destroy snail habitat while conducting these surveys.

Also in 2015, crayfish presence was surveyed in the springboxes at Three Forks which were modified the previous year to determine efficacy of these treatments. In SB1B, a control site and unmodified to prevent crayfish entry, 62 crayfish were documented. The other control site, SB1A, zero crayfish were detected. In SB3, modified in 2014, at least 201 crayfish were removed after they had reinvaded this site. Repairs were made in an attempt to prohibit crayfish from entering, as it appeared large, adult crayfish had forcefully infested the site through the hardware cloth previously installed here. At another modified springbox, SB2 no crayfish were detected in 2015, so the modification was successful over the past year. Also noted during the 2015 springsnail survey was the presence of sport anglers at Boneyard Creek, near PT1. These anglers are the first ever observed by the springsnail survey crew and we hope a sign of recovery of this waterway following the Wallow Fire in 2011.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Results over time

Over the course of this project, with the delays, the Wallow Fire, and permit issues, we have realized good results at all 8 project sites. Conifer thinning at the Campbell Blue site resulted in less canopy cover resulting in additional sunlight reaching the forest floor. This additional sunlight resulted in an increase of herbaceous vegetation, but the site has also been subjected to large scale floods which scoured the drainage bottom and resulted in the movement of large amounts of rock and boulders, along with significant amounts of sediment being deposited in the floodplain. Along with impacts of the Wallow Fire, the thinning project resulted in positive effects on this site. I fully expect this site to continue to see an increase in cottonwood and willow stands in the future.

Modifications made to spring boxes at the Three Forks project site are fully expected to provide long-term protections for the Endangered Three Forks Springsnail. Experimental protective measures to exclude invasive crawfish are expected to provide suitable habitat for springsnails but not allow crawfish to successfully sustain themselves. The Arizona Game and Fish Department continues to conduct annual surveys of the Three Forks springsnail population and results will be measured through these efforts. Related work along Boneyard Creek also focused on Three Forks Springsnail conservation using different techniques. Small exclosure fencing was placed to protect off-channel spring runs and willow sprouts. These exclosures are an attempt to protect these fragile sites from physical damage such as might be caused by elk wallows. AZGFD will also survey these sites annually for springsnail abundance. Also along Boneyard Creek, at the Clabbler City site, debris left over from former human activity was removed and hauled off. This included hundreds, if not thousands, of old tin cans, and the remains of abandoned cabins which had burned in a wildfire in the mid- to late 1990's. This debris was not only an eyesore, but posed a potentially dangerous situation for humans and wildlife.

Four project sites were treated with small exclosures to provide protection to Bebb's willow stands, North Spring, Turkey Creek, Hulsey Fork, and Home Creek. Three of these sites were impacted to some degree by the June 2011 Wallow Fire, especially Hulsey Fork and North Spring. Turkey Creek was not impacted directly by the fire, but did experience high water flows and woody debris and silt deposition as a result of rains following the fire. Home Creek was burned over but the willow stands at this site were not well established and did not experience any noticeable damage when the fire burned across the meadow. In fact, it was not 100% certain from visual observations if the fire in fact burned across the entire wet meadow. If it did the impacts to vegetation were ephemeral. Small exclosures were installed at each site to

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

The views or findings presented are the Grantee's and do not necessarily represent those of the Commission, the State, or the Arizona Department of Water Resources.

protect individual Bebb's willows or small stands of willows. Bebb's willows at North Spring and Hulsey Fork had sustained damage and most above ground growth was killed at both sites. Bebb's willows at Turkey Creek provided "control" points relative to those killed at other sites. New willow sprouts at North Spring were abundant in 2014 and 2015. Bebb's willows surviving the Wallow Fire at Hulsey Fork were exhibiting an abundance of new growth at all locations small exclosures were installed. At Turkey Creek the browse lines were disappearing and Bebb's willows were filling out nicely with dozens of new sprouts present. At Home Creek new willow sprouts were observed as well. Based upon measurements, counts, and visual observations the small exclosures are providing adequate protection from browsing and new growth is vigorous and healthy. It is believed the protection afforded by the small exclosures will meet objectives of this project. The small exclosures should have a life span in excess of 20 years and at this point Bebb's willows are expected to be mature and vigorous.

The final site treated was Upper San Francisco River project site, the largest site of Bebb's willow protection. This large meadow has multiple stands of Bebb's willow, along with other willow species, alder and aspen. Based on remote digital camera monitoring at this site there is also a healthy elk population using the area. Sprouts were once again documented on the Bebb's willows in this meadow following the installation of the 8' tall fence. As with the previous 4 sites, Bebb's willow sprouts were abundant and individual trees exhibited vigorous growth during the 2014 and 2015 monitoring efforts. The greatest threat to this project is falling trees. The Wallow Fire burned along the south edge of the meadow damaging some trees. Trees are also found along the north side of the exclosure. As with any fence built in the forest, falling trees will impact it. Close monitoring over the next 20 years will help resolve this issue. Herbaceous vegetation in the meadow will be protected from impacts of grazing and browsing ungulates and should continue to exhibit conditions expected in a high elevation wet meadow.

Suggestions for Changes or Future Actions

I cannot think of anything I might do differently. We made one change in habitat enhancements between Home Creek and Upper San Francisco River project sites, as discussed above. The Wallow Fire was certainly something we could not anticipate or control. However, in hindsight, it was fortuitous we had not installed small exclosures at North Spring and Hulsey Fork project sites before the fire as they would have been lost. The same can be said for the large exclosure at Upper San Francisco River project site as the fire burned up to the edge of the meadow and impacted a stand of trees the exclosure fence was subsequently built through. We may have lost a major portion of the fence.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

One item I am proud of is keeping a large ponderosa pine snag standing near the exclosure fence at the Upper San Francisco River project site. On the final inspection visit with the USFS we looked at and discussed the potential for this snag to fall onto the fence at some point in the future. It leans heavily in the direction of the fence and when it does fall, it will land on the fence. However, large snags are among the most important habitat features in our forests and removing it felt wrong. So to mitigate for any future damage if/when the snag falls, I had an extra H-brace installed in the fence. If/when the snag does fall it will only damage a small portion of the fence and not the entire length. In this case the repair will be minimal in cost and effort. The snag is well used by woodpeckers and other cavity nesting bird species, as scores of cavities and hundreds of holes used as an Acorn Woodpecker granary are present. And in 2014, a small colony of Purple Martin utilized the snag's cavities.

Fencing as used on this grant at Upper San Francisco River project site and the small exclosures used at 5 other sites are valuable in keeping ungulates from damaging sensitive habitats, but they are also expensive to install, costly to maintain, and unattractive. Installing these structures in forested habitats eventually results in trees falling onto them. Once damaged, the structural integrity is often lost. This is especially true with larger fences. A tree fell on one of the small exclosures at the North Spring project site. Initially I was of the opinion it should be removed and the exclosure rebuilt, but upon further observation, the tree is acting much like the fence in providing protection for a Bebb's willow to sprout. Further observation will prove this observation correct or incorrect. But for the short-term it seems to be working.

Future actions from my perspective do not involve large scale fencing projects except in extreme circumstances. How to define "extreme" I do not know, but fences are expensive and a short-term solution to a long-term problem. In the future I believe efforts should focus on large-scale habitat enhancement with the goal of protecting and enhancing watersheds and timber stands for multiple benefits. Healthy forests are dynamic and diverse habitats, providing many functions for wildlife and humans alike. One of the most important functions forests play is as watersheds. Through healthy riparian and upland habitats, precipitation will work its way through the natural system and provide abundant, clean water. Small scale projects may make us feel good, but they are just a drop in the bucket compared to what needs to be done. Major population centers of Arizona are situated outside and downhill from the major watersheds. The White Mountains, where this project was conducted, provide water and electricity for millions of Arizona residents, whether they realize it or not. Organizations and agencies such as the NWTF and the AWPF can and should work together to enhance and manage our forests and watersheds for long-term sustainability. This will only happen if hundreds of thousands of acres are managed with those goals in mind.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

Evaluation of the Success of Meeting Project Objectives

The 7 objectives of this project include:

1. Improve wildlife habitat, including wild turkey nesting and brood habitat
2. Provide protection for populations of native plant species, especially Bebb's willow
3. Improve water quality and natural flood and erosion control
4. Improve key habitats for many different species of plants and animals
5. Improve courtship and nesting habitats for migratory and resident birds
6. Improve habitat for threatened, endangered, and sensitive species
7. Enhance focal settings for recreational activities including nature study, photography, camping, hiking, birding, fishing and hunting.

Implementation of this project met the objectives as outlined above. 1. Wildlife habitat has been improved for multiple species, including wild turkeys. At the Campbell Blue project site, nesting and brooding habitat has been enhanced and wild turkeys are a commonly observed species there. Other species recorded using the enhanced habitat there include elk, mule deer, white-tailed deer, black bear, javelina, gray fox and Montezuma quail. 2. Protection of Bebb's willow, especially at North Spring and Hulsey Fork project sites have benefited greatly from the work conducted through this grant. I suspect Bebb's willow would likely be absent from these 2 sites if it were not for this project. 3. Water quality and flood mitigation has been realized on a small scale at every project site with the exception of Threeforks, where this was not the objective. 4. All project sites focused on riparian habitats and as such the work undertaken through this grant improved the rarest and most important habitat in Arizona, riparian habitat. A majority of native wildlife species utilize riparian habitats for all or part of their life cycles. And the diversity of native plant species abundance in riparian habitats are well documented. 5. Courtship and nesting habitats of migratory and resident bird species have been enhanced and increased through the work undertaken through this grant on multiple project sites, from Campbell Blue to Threeforks. 6. The most obvious threatened, endangered, and sensitive species benefiting from this work include Bebb's willow, Threeforks Springsnail, California Floater, Chiricahua Leopard Frog, and also a number of native fish species in Campbell Blue Creek. 7. Recreational activity opportunities have been enhanced, especially at the Campbell Blue project site through our work. Enhancement of native habitat always increases the abundance of native wildlife species which results in enhanced opportunities for birding, fishing, hunting, photography and nature study. We have realized these objectives with this project.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.

It has been a pleasure to partner with the AWPF to achieve the habitat enhancements on the Alpine Ranger District. No important work is accomplished without partnerships such as this and the funding provided for this work was expanded and utilized as non-Federal match for other projects with similar objectives and resulting in additional acreage being enhanced to benefit watershed and wildlife habitat.

The Arizona Water Protection Fund Commission has funded all or a portion of this report or project.